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Proceedings of the Central and Arctic Regional Science Advisory Process on the Recovery Potential Assessment of Spotted Gar in Canada

23 June 2010

Burlington Art Centre
1333 Lakeshore Road
Burlington, ON

Nicholas E. Mandrak
Meeting Co-chairperson

Marten A. Koops
Meeting Co-chairperson

Lynn Bouvier
Editor

Compte rendu du Processus de consultation scientifique régional du Centre et de l'Arctique sur l'évaluation du potentiel de rétablissement du lépisosté tacheté au Canada

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July 2010 | **Juillet 2010**

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Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings include research recommendations, uncertainties, and the rationale for decisions made by the meeting. Proceedings also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

Avant-propos

Le présent compte rendu a pour but de documenter les principales activités et discussions qui ont eu lieu au cours de la réunion. Il contient des recommandations sur les recherches à effectuer, traite des incertitudes et expose les motifs ayant mené à la prise de décisions pendant la réunion. En outre, il fait état de données, d'analyses ou d'interprétations passées en revue et rejetées pour des raisons scientifiques, en donnant la raison du rejet. Bien que les interprétations et les opinions contenues dans le présent rapport puissent être inexactes ou propres à induire en erreur, elles sont quand même reproduites aussi fidèlement que possible afin de refléter les échanges tenus au cours de la réunion. Ainsi, aucune partie de ce rapport ne doit être considérée en tant que reflet des conclusions de la réunion, à moins d'indication précise en ce sens. De plus, un examen ultérieur de la question pourrait entraîner des changements aux conclusions, notamment si l'information supplémentaire pertinente, non disponible au moment de la réunion, est fournie par la suite. Finalement, dans les rares cas où des opinions divergentes sont exprimées officiellement, celles-ci sont également consignées dans les annexes du compte rendu.

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SUMMARY

A regional science peer-review meeting was held on 23 June 2010 in Burlington, Ontario. The purpose of the meeting was to assess the recovery potential of Spotted Gar (*Lepisosteus oculatus*) based on the 17 steps outlined in the Fisheries and Oceans Canada (DFO) Recovery Potential Assessment (RPA) framework (DFO 2007). Spotted Gar was added to Schedule I of the *Species at Risk Act* (SARA) when it was proclaimed in June 2003. The resulting RPA Science Advisory Report will provide the information and scientific advice required for the Department to meet various requirements of SARA for this species including permitting and development of recovery strategies. Meeting participants included representatives from DFO (several sectors), Long Point Conservation Authority, University of Windsor, and Canadian Wildlife Service, Environment Canada. This proceedings report summarizes the relevant discussions from the peer-review meeting and presents revisions to be made to the associated research documents.

The working papers presented at the workshop will be published in the form of Canadian Science Advisory Secretariat (CSAS) Research Documents. The advice from the meeting will be published as a CSAS Science Advisory Report.

SOMMAIRE

Une réunion régionale d'examen scientifique par des pairs a eu lieu le 23 juin 2010 à Burlington, en Ontario. Le but de la réunion était d'évaluer le potentiel de rétablissement du lépisosté tacheté (*Lepisosteus oculatus*), selon les 17 étapes décrites dans le cadre d'évaluation du potentiel de rétablissement (EPR) de Pêches et Océans Canada (MPO) (MPO 2007). La lépisosté tacheté a été inscrit à l'Annexe I *de la Loi sur les espèces en péril* (LEP) au moment de la promulgation de celle-ci, en juin 2003. L'avis scientifique sur l'EPR fournira l'information et l'avis dont le Ministère a besoin pour respecter les diverses exigences de LEP relativement à cette espèce, y compris la délivrance de permis et l'élaboration de programmes de rétablissement. Parmi les participants à la réunion, mentionnons des représentants du MPO (plusieurs secteurs), de la Long Point Conservation Authority, de l'Université de Windsor, du Service canadien de la faune et d'Environnement Canada. Le présent compte rendu résume les discussions tenues dans le cadre de cet examen par des pairs et fait état des révisions à apporter aux documents de recherche utilisés.

Les documents de travail présentés à l'atelier seront publiés sous la forme de documents de recherche du Secrétariat canadien de consultation scientifique (SCCS). L'avis formulé au cours de la réunion sera publié sous la forme d'un avis scientifique du SCCS.

INTRODUCTION

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated the Spotted Gar (*Lepisosteus oculatus*) as Threatened in November 2000, and reassessed and confirmed this designation in May 2005. The reason given for this designation was that Spotted Gar "...has a very limited range in Canada where it is only known from three coastal wetlands in Lake Erie. Although its distribution is likely limited by temperature, some of the shallow vegetated habitats that it requires for all life stages are subject to the impacts of siltation, dredging, filling, and aquatic vegetation removal and harbour improvements". In June 2003, Spotted Gar was added to Schedule I of the *Species at Risk Act* (SARA). A Recovery Potential Assessment (RPA) process has been developed by Fisheries and Oceans Canada (DFO) to provide information and scientific advice needed to fulfill SARA requirements including listing decisions, the development of recovery strategies, and authorizations to carry out activities that would otherwise violate SARA (DFO 2007).

The purpose of the meeting, as outlined in the Terms of Reference (Appendix 1), was to assess the recovery potential of Spotted Gar. The RPA is a science-based peer review process that assesses the current status of the species by addressing the 17 steps in the RPA framework outlined in the Revised Protocol for Conducting Recovery Potential Assessments (DFO 2007). The current understanding of the distribution and abundance of this species, along with recovery targets and times to recovery habitat requirements, threats to both Spotted Gar and its habitat, and measures to mitigate these impacts, is included in the Science Advisory Report (DFO 2010)

The peer review meeting to discuss the RPA for Spotted Gar was held at the Burlington Art Centre, Burlington, Ontario on 23 June 2010. Meeting participants included participants from DFO, Long Point Conservation Authority, University of Windsor, and Canadian Wildlife Service, Environment Canada (Appendix 2). The RPA meeting agenda can be found in Appendix 3.

This proceedings report summarizes the relevant discussions from the peer-review meeting and presents revisions to be made to the associated research documents. The research documents (Bouvier and Mandrak 2010; Young and Koops 2010) are the revised working papers presented at the workshop, and the Science Advisory Report summarizes the current understanding of the distribution and habitat requirements of Spotted Gar, along with recovery targets and times to recovery while considering various management scenarios (DFO 2010).

DETAILED DISCUSSION

The meeting co-chair provided the participants with an introduction to the RPA process. This included an explanation of the purpose of the meeting and how the products of the meeting might be used. Draft research documents had been developed by DFO and provided to participants in advance of the meeting. The draft documents were the basis for discussion and participants were encouraged to add to or change the material, as needed, to ensure that the best, most accurate information was included.

SPECIES STATUS AND HABITAT REQUIREMENTS
Presenter: Lynn Bouvier

A presentation was provided to the participants on the status and habitat requirements of Spotted Gar. This included a description of the species, and information related to the morphological differences between the Spotted Gar and other similar gar species [i.e., Longnose Gar (*L. osseus*) and Florida Gar (*L. platyrhinchus*)]. Habitat requirements for various Spotted Gar life stages [spawning and nursery; young-of-the-year (YOY) and juvenile; adult] were also presented. Maps illustrating the estimated areas in Rondeau Bay that support these life stages were also included.

A participant asked whether Spotted Gar preferred a certain percentage of submerged vegetation versus open water habitat. Another participant responded that this information is not available in the literature but based on personal first-hand observations that a high percentage of submergent vegetation is generally present when Spotted Gar are observed. Another participant added that in early spring, macrophyte type is generally dominated by emergent species, and as the season progresses, there is a shift towards an increased amount of submergent vegetation.

A participant noted that in the background section of the working paper, Spotted Gar preferred temperature is listed as 16°C; however, the presentation indicated that 22°C was the average recorded temperature for all Spotted Gar captured in Canada. Seeing as though Spotted Gar are considered a warmwater species, 16°C seemed rather low for their preferred temperature. It was clarified that the estimate of 22°C was based on actual field measurements and should be considered a more accurate temperature preference. Also the participant noted that no reference was provided in the research document for the estimate of 16°C. The presenter clarified that this value should be referenced as Coker *et al.* (2001) and that this information will be added to the research document. It was also decided to include the average Spotted Gar capture temperature (22°C) to the research document.

A participant inquired as to whether or not Spotted Gar required both deep and shallow water, as 'shallow water' was used when defining preferred habitat. Participants discussed diurnal movement patterns, and factors that may be driving such movement. One participant mentioned that diurnal movement is likely related to feeding; Spotted Gar have been observed feeding more at night in areas closer to shore, suggesting that movement could be a result of temperature preference during the day or it they could be following the movement of prey (baitfish) at night. It was pointed out that it is unknown what is driving Spotted Gar diurnal movement, but suggestions were temperature or possibly camouflage.

In relation to the map provided of adult habitat in Rondeau Bay, a participant asked whether the delineated habitat was based on fish collection data or presence of vegetation. It was noted that the map was primarily based on fish tracking data but it also corresponded to the presence of vegetation. A participant pointed out that 25 years ago, the highlighted areas were all open water and inquired as to what type of habitat Spotted Gar would have used for survival at that time. A participant indicated, that it is unknown whether Spotted Gar were in decline, or perhaps more confined to the shore areas at that time. Furthermore, until 2002, only six Spotted Gar were documented from Rondeau Bay, suggesting that perhaps the low numbers of Spotted Gar could be related to the lack of vegetated habitat.

RECOVERY TARGETS
Presenter: Marten Koops

The presentation on recovery targets included information on abundance, habitat and distribution targets for Spotted Gar recovery. SARA requires population targets (versus abundance), although abundance can be included.

In relation to maximized benefit (risk reduction) for cost (effort), a participant asked whether there is a number attributed to the vertical arrow shown on the graph. For Spotted Gar, this equates to approximately a 1% risk of extinction. In terms of how much data go into the model, the document outlines that the model is highly dependent on early life stage data.

A participant inquired as to the methods used to measure cost and effort. It was pointed out that the relationship between cost and effort is linear. Increasing population size is linearly related to cost, although this may not hold true in all cases. It is possible that the relationship between cost and effort is exponential. A participant asked whether the initial cost would be higher to obtain initial increases in population size and once the population becomes established the cost would be reduced as long as the necessary habitat is maintained. It was noted that this may be the case based on the assumption that habitat is not limiting; if habitat is limiting, there is a high cost with ensuring there is enough habitat.

With respect to extinction threshold, a participant asked whether data from additional (other than Rondeau Bay) Spotted Gar populations were considered. It was noted that other Spotted Gar populations (i.e., located in the United States) may have more robust datasets that may lend support to the current extinction threshold. It was then asked how real populations compare with the model results. It was pointed out that, as is the case for any rare species, it is very difficult to generate real estimates. For example, during a mark and recapture study there were only four recaptures recorded from hundreds of marked Spotted Gar at Rondeau Bay, making it impossible to determine population size.

There was some discussion with respect to Spotted Gar reproduction and sex ratios. A participant asked whether there were any indication of a shift away from a 1:1 sex ratio. Another participant responded that this has not been determined for Canadian populations; however, in Louisiana, USA, there may be as much as a 3:1 male:female sex ratio. A participant asked whether there is information on changes in sex ratios over latitudinal gradients. The participants did not know if such a gradient exists. The presenter introduced the relationship between MVP and Minimum Area for Population Viability (MAPV), and provided MAPV results for all extinction scenarios. A participant suggested that the document should be revised to include a strong statement encouraging managers that they should not manage down to MAPV.

POPULATION STATUS
Presenter: Lynn Bouvier

The presentation provided distribution mapping for Spotted Gar in Canada. Information was presented on relative abundance, population trajectory, the certainty related to both of these parameters, and the status of each population. Participants were asked to comment on the assessment of Spotted Gar population status.

The population status assessment for Lake St. Clair was questioned by a participant. They questioned that, since only one individual was ever caught in this system, was it assumed that a viable population once existed? The presenter replied that the habitat near the point of capture

can be considered suitable Spotted Gar habitat but it is not known whether a viable population once existed in this area. It was decided to maintain the current population status ranking for Lake St. Clair, although the certainty associated with this ranking was increased to '2'.

After considering the new 2010 records for Long Point Bay (B. Glass, unpubl. data), the populations status ranking was changed from 'unknown' to 'low'.

A participant inquired as to why the East Lake population would be assessed differently than the Long Point Bay population. It was noted that the information for the Long Point Bay population is more recent than the East Lake population and that there have now been several captures in the Long Point Bay area, but only a single Spotted Gar was ever captured from East Lake. A participant questioned whether the research document provided sufficient explanation on how a population is assessed. It was decided to add explanatory text under the East Lake heading to further justify the population status assessment for this location.

There were no recommendations from participants regarding the assessment of the North Channel location; however, it was recommended that the authors seek further guidance from the Ministry of Natural Resources located in Picton, Ontario, who would be knowledgeable in the history of commercial fishing in this area.

The overall population status classification were maintained for all populations, with the exception of Long Point Bay which was changed from 'unknown' to 'poor' based on the new 2010 records at this location.

THREAT STATUS
Presenter: Nick Mandrak

The presentation included a description of the parameters that were used to assess the threat status for each Spotted Gar population, which included threat likelihood, threat impact, and certainty of the threat impact. Types of threats to Spotted Gar and their habitat were presented on a population-by-population basis and the threat status for each parameter was provided (in tabular form) for discussion and comment. Where the threat status was unknown, the participants were asked to help fill in the knowledge gaps based on their knowledge and experience. Overall threat to Spotted Gar populations was also presented in relation to spatial extent and temporal extent and the participants were asked to comment on the assessment.

Point Pelee National Park

A participant pointed out that two threats listed in the table, habitat modifications and aquatic vegetation removal are indeed related (i.e., aquatic vegetation removal is a type of habitat modification). The presenter indicated that due to the importance of aquatic vegetation to numerous Spotted Gar life stages, it was decided that 'aquatic vegetation removal' should be discussed on its own to highlight its importance. It was decided to revise the document so that the decision to remove 'aquatic vegetation removal' from 'habitat modifications' be very clear.

In relation to threat likelihood, a participant asked how the term 'occur' is defined and how it is assessed. It was noted that occurrence is ranked as either 'known to occur' or '>50% chance of occurring' and '<50% chance of occurring' and that no additional qualifications are made.

A participant asked whether Round Goby (*Neogobius melanostomus*) are found at Point Pelee. It was pointed out that there is a section on exotic species in the document that addresses the

impacts of Round Goby on Spotted Gar. The predominant concern related to Round Goby is that they feed on Spotted Gar eggs; however, the eggs are thought to be toxic so it is likely that Round Goby have little impact on Spotted Gar.

A participant suggested that the recreational fishing records for Point Pelee should be researched to provide additional information on the effect of recreational fishing in this area.

Rondeau Bay

A participant noted that there was a difference in the classification of 'turbidity' for the Rondeau Bay and Point Pelee populations and asked whether this was related to the increased amount of sampling that has been completed for Rondeau Bay. The presenter clarified that the Rondeau Bay classification was based on the extensive research by Gilbert *et al.* (2007). Certainty would still be considered a '3' (expert opinion) because the study did not examine the specific effects of turbidity on Spotted Gar.

There was some discussion on the effects that Eurasian milfoil (*Myriophyllum spicatum*) may have on Spotted Gar. A participant asked whether the presence of Eurasian milfoil could be beneficial to Spotted Gar as it provides additional vegetative cover. A participant added that he noted an association between Spotted Gar and Eurasian milfoil, but most Spotted Gar from Rondeau Bay were captured in mixed beds. The presenter explained that Eurasian milfoil was included as a threat because it is known to become very dense, blocking out sunlight, resulting in decreased levels of dissolved oxygen. It was emphasized by a participant that this does not create a problem for Spotted Gar as it can tolerate low levels of dissolved oxygen, but rather that this becomes a problem for the small fishes that act as a food source for Spotted Gar. It was agreed that this should be made clear in the text.

During discussions on the effect of incidental harvest on Spotted Gar, participants decided that commercial and recreational fishing, as well as baitfish harvesting is 'known to occur' but the likelihood of capture is unknown. It was decided to change the threat likelihood from 'known to occur' to 'likely to occur', and maintain threat impact as 'low'.

A participant suggested that the Rondeau Bay Vegetation Removal Committee should be contacted to obtain additional information on vegetation removals in Rondeau Bay.

Long Point Bay

The presenter emphasized the difficulty in classifying the threats for Long Point Bay as this location consist of very different areas: Long Point National Wildlife Area; Big Creek Marsh; and, Long Point Inner Bay. When discussing 'habitat modifications', a participant noted that no shoreline hardening would not occur as this activity is not permitted in this area; however, dredging is currently allowed. A participant suggested that he thought that dredging may be beneficial to various fish species because it allows for an easily navigable connection between different areas in the Inner Bay. A participant suggested that the Ministry of the Environment (MOE) should be contacted for additional information on vegetation removal in Long Point Bay, as these activities would require a MOE permit. Changes to the threat status table included changing the threat likelihood for 'turbidity and sediment loading' from 'likely to occur' to 'known to occur' while maintaining the threat impact as 'high'.

It was reiterated that the new 2010 catch data (B. Glass, unpubl. data) should be incorporated in the text, and that revisions should be made to the text to emphasize the difficulty in classifying Long Point Bay due to its numerous habitat types.

The presenter noted the threat impact classifications account for the extent of Spotted Gar occurrence at each location. Participants agreed that this was not clear in the text and should be revised.

Lake St. Clair

The presenter explained that it is necessary to classify threats for extirpated population in case the area in which the extirpated population was found is considered during recovery efforts.

A participant suggested that the Essex-Erie Conservation Authority (ERCA) should be contacted to inquire whether information on aquatic vegetation removal is available for this location, as they would be involved in any dredging permit application. As well, MOE should be contacted for additional information related to the application for permits for chemical vegetation removal.

There was some discussion on the threat of 'nutrient loading'. A participant suggested that the threat impact should be, at the very least, categorized as 'medium' based on nutrient loading inputs from the Thames River into Lake St. Clair. It was noted that the predominant concern with nutrient loading for Spotted Gar is the proliferation of algal blooms. It was decided to maintain the threat impact for nutrient loading as 'low' as the location where the Spotted Gar was captured is approximately 4 km west of the mouth of the Thames River and may not be severely affected by nutrient inputs from the Thames River.

Changes to the threat status table included: mechanical vegetation removal threat likelihood listed as 'known to occur' and threat impact listed as 'unknown' pending further discussions with ERCA; chemical vegetation removal listed as 'unknown' pending further discussions with the MOE; and, the turbidity and sediment loading threat impact to be changed from 'medium' to 'high'.

East Lake

It was noted that the East Lake population of Spotted Gar is included in the threat assessment because an extant population may exist at this location, although it is thought to be very unlikely.

Changes to the threat status table included: changing mechanical vegetation removal threat likelihood from 'unlikely to occur' to 'likely to occur'; turbidity and sediment loading threat impact was changed from 'medium' to 'unknown'; nutrient loading threat impact was changed from 'medium' to 'unknown'; and, the exotic species threat impact was changed from 'low' to 'medium'.

North Channel Population

A participant asked whether it was necessary to assess threats in the North Channel as this habitat is not suitable for Spotted Gar and this area would not be considered as a suitable location to implement recovery efforts. The participants agreed that the North Channel record was an anomaly and that the likelihood of a population of Spotted Gar occurring in the North

Channel is very low. Subsequently, it was decided to remove North Channel from the threat status assessment.

Conclusions

A participant suggested that in the 'overall effect of threats' table that the mechanical and chemical aquatic vegetation removal should be changed from 'ephemeral' to 'ephemeral/chronic'. This would lend support to the footnote that the temporal extent classification is indicative of a single removal event and that subsequent or repetitive aquatic vegetation removal events would be categorized as chronic.

The authors are to revise the threat status according to the discussion on threat likelihood and threat impact. It was decided that the revised threat status tables will be sent to participants for their review before they are accepted to confirm that all discussed revisions were implemented.

ALLOWABLE HARM
Presenter: Jennifer Young

The presentation on allowable harm included information on Spotted Gar life cycle, life history relationships and parameter estimates, population projection matrix, and sensitivity and allowable harm modeling results.

It was noted by a participant that the allowable harm model does not account for maternal effects (i.e., older females produce better quality eggs). This was confirmed by the presenter who added that maternal effects could potentially be included in future models but additional information would be required.

A participant asked whether allowable harm results could be applied to habitat (e.g., results would provide an area of Spotted Gar habitat that could potentially be lost without affecting the population). The presenter clarified that the results provided represent a percentage loss of survival, and to relate these values to habitat, the impacts of habitat loss to the survival of the species would have to be known. This is information is currently unavailable.

Participants discussed how the science advice would be applied to provide guidance for allowable harm from a habitat protection and permitting perspective (e.g., a request to modify the habitat). A participant asked whether the science advice could assume a linear relationship between survival and habitat. It was noted by the presenter that further simulations in the modeling would be required to confirm a linear relationship between survival and habitat.

RECOVERY PROJECTIONS
Presenter: Jennifer Young

The presentation on recovery projections provided information to participants on Spotted Gar recovery targets, recovery strategies, population recovery times based on different recovery strategies, required habitat and habitat restrictions, and uncertainties.

It was noted that one major issue for Spotted Gar recovery is that the current population size for all populations is unknown. The presenter inquired as to whether there was insight from the participants on the value of the extinction threshold. The participants responded that they have no additional insight on what value should be used for the extinction threshold.

ALTERNATIVES AND MITIGATION METHODS
Presenter: Lynn Bouvier

The presentation included information on pathways of effects, alternatives to activities and feasible mitigation methods. It was noted that a guidance document (Coker *et al.* 2010) that is meant to act as a supplement to the RPA research documents has been published. This document is to provide alternatives for mitigation to minimize or avoid the effects of habitat-related threats.

Mitigations and alternatives were presented for the non-habitat related threats. During the presentation on 'exotic species', a participant questioned whether the concept of 'safe harbours' was included in any current Canadian legislation. It was clarified that this term was used incorrectly in the document and that the recommendation of establishing 'safe harbours' does not provide legal protection for the habitat but rather that it is a concept to minimize impact or to prevent the introduction of exotic species through best management practices. It was decided to correct and clarify the wording in the text of the research document.

It was clarified that the mitigation methods presented in the research document were not meant to be exhaustive but were intended to provide a few examples. This list of mitigations is primarily used in the socio-economic analysis process. It was also noted that the recommended mitigation method of removal and control of non-native species from areas known to be inhabited by Spotted Gar does not permit the removal of these species without the proper permits and approvals.

A participant mentioned that they were familiar with the term mitigation as referring to prevention. It was suggested by a participant that mitigation can also be in reference to minimizing an impact as well as prevention. It was suggested that the recommendation for watershed monitoring as a feasible mitigation method to the threat of exotic species should include an action. Another participant suggested that all the recommended mitigation methods relating to monitoring be combined into one point. It was agreed that the alternative of 'unauthorized introductions' was unclear in the text. It was decided that the points relating to monitoring to mitigate threat of exotic species would be reworded to include mitigation action and that the wording for the alternatives of exotic species would be modified to increase clarity in the document.

In relation to the mitigations and alternatives presented for the threat of incidental harvest, participants asked whether angling restrictions could be added to the recommended mitigation methods section. It was decided that wording for anglers and control for timing of fishing would be added to the mitigation section so that fishing does not occur during spawning periods for Spotted Gar. In addition, it was also decided that wording related to recreational fishing would be added to the alternative section.

SOURCES OF UNCERTAINTY
Presenter: Lynn Bouvier

The presentation on sources of uncertainty reviewed four main areas where uncertainty exists for Spotted Gar: population structure; habitat requirements; threats; and population modeling.

A participant noted that uncertainty related to habitat requirements for juvenile life stages is a significant knowledge gap in the modeling and that it would be important to know the amount of juvenile Spotted Gar habitat in Rondeau Bay. This is currently a limiting factor for Spotted Gar

population viability and if juvenile habitat is determined to be larger (i.e., overlaps with adult Spotted Gar habitat), this variable would not have such large limiting effects on population growth. It was pointed out that this would be difficult to determine due to difficulties in collecting juveniles. In the absence of this type of data, a conservative approach would assume that juveniles are restricted to the currently delineated juvenile habitat.

A participant asked whether it is still uncertain that a reproducing population of Spotted Gar exists at Long Point Bay in light of the new 2010 data. Another participant noted that the weight of the evidence (i.e., eight new captures and a large distance from the closest known population) would suggest that there is a reproducing population although there is still some uncertainty.

A participant suggested that the same vegetation removal descriptors (i.e., type of removal) be used throughout the research documents. Participants agreed that the two types of vegetation removal should be 'mechanical' and 'chemical' and that all reference to 'herbicidal' should be removed.

SUMMARY OF DISCUSSION

The following major conclusions were reviewed for readability and edited accordingly.

- The current and historic Spotted Gar distribution is limited to five distinct locations of the Great Lakes basin: Point Pelee National Park, Rondeau Bay, Long Point Bay, East Lake and North Channel. Two of these locations are represented by a single record (East Lake and North Channel) (Figure 1). Current Spotted Gar population sizes are unknown.
- Adult Spotted Gar are typically found in shallow waters (Canadian records ranged from 0.23 to 2.6 m) of wetlands, marshes or flooded riparian areas. Dense vegetation appears to be a mandatory component of adult Spotted Gar preferred habitat. There are very limited data on habitat requirements for young-of-the-year (YOY) and juvenile Spotted Gar, necessitating the inference of these requirements from the adult life stage. Spawning occurs in the nearshore areas adjacent to preferred adult habitat.
- To achieve ~99% probability of persistence, given a 15% chance of catastrophic decline (50%), requires ~1400 adult Spotted Gar and at least 360 ha of suitable habitat. The definition of "extinct" has a large impact on MVP size. If an extinction threshold of 10 females is considered, MVP becomes ~14000 adults requiring 3500 ha. Extinction risk is elevated exponentially when suitable habitat is at or below the minimum area for population viability.
- In the absence of additional harm or recovery effort, a population at 10% of MVP has a 95% chance of recovering within 45-66 years (depending on frequency of catastrophic events). Increasing survival of YOY and juveniles (the most efficient strategy) by just 10% improves recovery time to 23-29 years.
- The greatest threats to the survival and persistence of Spotted Gar in Canada are related to habitat modification and destruction, aquatic vegetation removal, increases in nutrient loading, and increases in turbidity and sediment loadings resulting from agricultural and urban development. Lesser threats that may be affecting the survival of Spotted Gar include the introduction of exotic species, and incidental harvest through the baitfish and commercial fishing industries.
- Cumulative harm to annual survival of YOY and juvenile stages should not exceed 8%. Cumulative harm to adult survival or reproduction should not exceed 14 or 16%, respectively. Harm that exceeds affects multiple vital rates should be restricted further. For

example, cumulative harm to survival of all life stages should not exceed 5%. Recovery time is delayed exponentially by any amount of harm above or below these thresholds.

- There remain numerous sources of uncertainty related to Spotted Gar population size, structure and the level of connectivity between populations. There is very little information available on preferred habitat of juvenile Spotted Gar. Numerous threats have been identified for the Spotted Gar, although the direct impact that these threats might have on Spotted Gar populations is currently unknown.

SUMMARY OF REVISIONS

Changes to the research documents include:

- Habitat requirements:
  - preferred depth range will be provided, habitat requirements for young-of-the-year and juveniles will be added, and the temperature preference will be revised to reflect more recent data and to include the related reference in the document;
  - based on the importance of vegetation to the habitat of Spotted Gar, the document will be revised to clarify why removal of aquatic vegetation was separated from other 'habitat modifications'.
- Population status:
  - all changes to the population status table (i.e., relative abundance index and population trajectory) will be implemented.
- Recovery targets:
  - wording will be added to the document to reflect that extinction risk is increased when a minimal amount of suitable habitat is present or available.
- Threat status:
  - wording surrounding discussion on Eurasion milfoil in the document will be changed from 'importance' to 'significance' so that it does not imply a positive relationship with Spotted Gar presence;
  - MOE will be contacted to obtain information on chemical vegetation removal for known Spotted Gar locations;
  - ERCA will be contacted to obtain information on vegetation removal in Lake St. Clair;
  - Point Pelee National Park will be contacted to determine if records on recreational fishing in the park indicate that Spotted Gar have been caught by anglers;
  - North Channel population will be removed from the threat impact table because the habitat present at the location of capture does not resemble preferred habitat for Spotted Gar and it is believed that there is not a reproducing population at this location;
  - in the overall effects of threats on Spotted Gar populations table, mechanical and chemical vegetation removal will be changed from 'ephemeral' to 'ephemeral/chronic';
  - all changes to the threat status table (i.e., threat likelihood and threat impact) will be implemented.
- Mitigations and alternatives:
  - Mitigations for exotic species will be re-worded and actions will be linked to current mitigation statements;
  - wording in the document will include anglers and that control for timing of fishing will be added to the mitigation section so that fishing does not occur during spawning periods for Spotted Gar.

The authors indicated that the documents would be modified based in accordance with the groups' comments. The participants would have two weeks to review the changes before the final draft was submitted.

REFERENCES

Bouvier, L.D. and N.E. Mandrak. 2010. Information in support of a Recovery Potential Assessment of Spotted Gar (*Lepisosteus oculatus*) in Canada. DFO Can. Sci. Advis. Sec. Res. Doc. 2010/079. v + 22 p.

Coker, G.A., D.L. Ming and N.E. Mandrak 2010. Mitigation guide for the protection of fishes and fish habitat to accompany the species at risk recovery potential assessments conducted by Fisheries and Oceans Canada (DFO) in Central and Arctic Region. Version 1.0. Can. Manuscr. Rep. Fish. Aquat. Sci. 2904. vi + 40 p.

DFO. 2007. Revised protocol for conducting recovery potential assessments. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2007/39.

DFO. 2010. Recovery Potential Assessment of Spotted Gar (*Lepisosteus oculatus*) in Canada. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2010/047.

Gilbert, J., G. Dunn, and B. Locke. 2007. Rondeau Bay ecological assessment report. Report prepared for the Ontario Ministry of Natural Resources. May 2007. iv + 220 p.

Young, J.A.M. and M.A. Koops. 2010. Recovery potential modelling of Spotted Gar (*Lepisosteus oculatus*) in Canada. DFO Can. Sci. Advis. Sec. Res. Doc. 2010/078. iv + 20 p.

Appendix 1. Terms of Reference

Terms of Reference

Recovery Potential Assessment of Spotted Gar

Regional Advisory Meeting

Burlington Art Centre, Burlington, ON

23 June 2010

Co-chairs: Nicholas Mandrak and Marten Koops

Background
In May 2005, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated the Spotted Gar as Threatened. The reason for designation being that this species has a very limited range in Canada where it is only known from three coastal wetlands in Lake Erie. Spotted Gar was subsequently added to Schedule I of the *Species at Risk Act* (SARA).

Fisheries and Oceans Canada (DFO) Science has been asked to undertake a Recovery Potential Assessment (RPA) for the Spotted Gar. DFO Science developed the RPA framework to provide the information and scientific advice required for the Department to meet various requirements of SARA including listing decisions, authorizations to carry out activities that would otherwise violate SARA and the development of recovery strategies. The RPA may be used to inform both scientific and socio-economic elements of the listing decision, as well as development of a recovery strategy and action plan, and to support decision-making with regards to the issuance of permits, agreements and related conditions, as per section 73, 74, 75, 77 and 78 of SARA.

This advisory meeting is being held to assess the recovery potential of Spotted Gar. The resulting RPA Science Advisory Report will summarize the current understanding of the distribution, abundance and trend of this species, along with recovery targets and times to recovery while considering various management scenarios. The current state of knowledge about habitat requirements, threats to both habitat and Spotted Gar, and measures to mitigate these impacts, will also be included in the Science Advisory Report.

Objectives
The intent of this meeting is to assess the recovery potential of Spotted Gar using the RPA framework outlined in the Revised Protocol for Conducting Recovery Potential Assessments (available at: http://www.dfo-mpo.gc.ca/csas/Csas/status/2007/SAR-AS2007_039_e.pdf). The advice will be provided to the DFO Minister for her consideration in meeting various requirements of SARA for this species.

Products
The meeting will generate a proceedings report summarizing the deliberations of the participants. This will be published in the Canadian Science Advisory Secretariat (CSAS) Proceedings Series. There will be CSAS Research Document(s) produced from the working

paper(s) presented at the meeting. Advice from the meeting will be published in the form of a Science Advisory Report.

Participants

Experts from DFO, Ontario Parks, Ontario Ministry of Natural Resources, Royal Ontario Museum, Parks Canada, Canadian Wildlife Service, conservation authorities and academia have been invited to this meeting. Participants will not exceed a maximum of 30 people.

Appendix 2. Meeting Participants

Recovery Potential Assessment of Spotted Gar

Regional Advisory Meeting – Central and Arctic Region

Burlington Art Centre, Burlington, ON

23 June 2010

LIST OF ATTENDEES

Last name	First name	Affiliation
Boyko	Amy	Fisheries and Oceans Canada - Oceans Habitat and Species at Risk
Bouvier	Lynn	Fisheries and Oceans Canada - Science
Dunn	Shelly	Fisheries and Oceans Canada - Oceans Habitat and Species at Risk
Gagnon	Paul	Long Point Conservation Authority
Glass	Bill	University of Windsor
Koops	Marten	Fisheries and Oceans Canada - Science
Mandrak	Nick	Fisheries and Oceans Canada - Science
Robinson	Jeff	Canadian Wildlife Service, Environment Canada
Sinnatamby	Nilo	Note taker
Young	Jennifer	Fisheries and Oceans Canada - Science

Appendix 3. Agenda

REVISED AGENDA

Recovery Potential Assessment– Spotted Gar
Regional Peer Review Meeting – Central and Arctic Region

Burlington Art Centre
1333 Lakeshore Road
Burlington, ON

23 June 2010

Co-chairs: Nick Mandrak and Marten Koops

23 June (Wednesday)

9:00	Welcome and Introductions	Nick Mandrak
9:15	Purpose of Meeting	Nick Mandrak
9:30	Species Status and Habitat Requirements	Lynn Bouvier
9:45	Recovery Targets	Marten Koops
10:30	Break (refreshments provided)	
10:45	Population Status	Lynn Bouvier
11:15	Threats	Nick Mandrak
12:00	Lunch (provided)	
12:45	Threats (continued)	Nick Mandrak
1:30	Allowable Harm	Jennifer Young
2:30	Break (refreshments provided)	
2:45	Recovery Projections	Jennifer Young
3:45	Alternatives to Activities/Feasible Mitigation Methods	Lynn Bouvier
4:15	Summary and Wrap-up	Nick Mandrak